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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,659	06/23/2005	Koji Moriuchi	10873.1716USWO	5389

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EXAMINER	
FREEMAN, JOHN D	
ART UNIT	PAPER NUMBER
1794	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/540,659	MORIUCHI ET AL.	
	Examiner	Art Unit	
	John Freeman	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 April 2009 and 14 May 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *18-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *18-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 June 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: Table 5 on p24 appears to have incorrect headings:

	Monomer		Additive (mass parts)
	Acid anhydride component (molar ratio)	Diamine component (molar ratio)	
Working Example 7	4,4'-DDS(100)	BPDA/BPADA(90/10)	γ-butyrolactone (214)

4,4'-DDS is the diamine component, and BPDA/BPADA is the acid anhydride component.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 18-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi et al. (US 5,554,684) in view of Peters et al. (US 4,965,337), Hawley's Condensed Chemical Dictionary (14th Edition), and Matsumoto et al. (US 6,100,365).

4. Regarding claim 18:

5. Choi et al. (hereafter Choi) disclose a polyimide precursor composition (col 1 ln 33-62). Polar solvents are used, such as NMP (col 2 ln 4-20). Choi teaches a combination of aromatic dianhydrides can be used (col 2 ln 27-31), including BPDA (col 2 ln 47) and BPADA (col 2 ln 62). The diamine can be 4,4'-DDS (col 3 ln 29-30).

6. Choi is silent with regard to the molar ratio of the dianhydrides.

7. It has long been an axiom of United States patent law that it is not inventive to discover the optimum or workable ranges of result-effective variables by routine experimentation. *In re Peterson,* 315 F.3d 1325, 1330 (Fed. Cir. 2003) ("The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages."); *In re Boesch,* 617 F.2d 272, 276 (CCPA 1980) ("[D]iscovery of an optimum value of a result effective variable in a known process is ordinarily within the

skill of the art."); *In re Aller,* 220 F.2d 454, 456 (CCPA 1955) ("[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."). "Only if the 'results of optimizing a variable' are 'unexpectedly good' can a patent be obtained for the claimed critical range." *In re Geisler,* 116 F.3d 1465, 1470 (Fed. Cir. 1997) (quoting *In re Antonie,* 559 F.2d 618, 620 (CCPA 1977)).

8. See Peters et al. (hereafter Peters) which compares BPDA/SDAN and BPADA/SDAN polyimides. SDAN stands for 4,4'-sulfonyl dianiline, equivalent to 4,4'-DDS. Peters notes the two polymers have different glass transitions temperatures and solvent-resistance properties (col 13 ln 5-23). The examiner reasonably concludes, therefore, that an artisan of ordinary skill would recognize that using the dianhydrides as comonomers, as taught by Choi, would require optimization to achieve an acceptable balance between glass transition temperature, which affects *inter alia* processing properties, and solvent resistance. At the time of the invention, it would have been obvious to one of ordinary skill in the art to vary the ratio of the dianhydrides, including over the broad range claimed by Applicant, to balance these properties.

9. Choi is silent with regard to the addition of a cyclic compound as claimed.

10. Propylene carbonate is a well-known plasticizer. See Hawley's Condensed Chemical Dictionary (14th Edition) description of propylene carbonate. At the time of the invention, it would have been obvious to one of ordinary skill in the art to add propylene carbonate as a plasticizer to the polyimide precursor, including amounts that would intrinsically prevent discoloration, to create a polymer that has better flexibility, and also prolong the time before said polymer becomes brittle.

11. Also γ-butrolactone was a well-known organic polar solvent suitable for use with polyimide precursors. As exemplified by Matsumoto, it was well-known to one of ordinary skill that multiple solvents, such as NMP and γ-butrolactone, could be used together (col 6 ln 36-54). At the time of the invention, it would have been obvious to one of ordinary skill in the art to include multiple polar solvents, including γ-butrolactone in amounts that would intrinsically prevent discoloration, to arrive at a precursor having the desired level of dissolution and concentration.

12. Regarding claim 19:

13. The precursor solution contains 5-20% by weight of solids (col 5 ln 2-4). Changing these values to 100 mass parts, results in the solvent being in the range of 400-1900 mass parts.

14. Choi is silent with regard to the loading of the propylene carbonate. As noted above, it has long been an axiom of United States patent law that it is not inventive to discover the optimum or workable ranges of result-effective variables by routine experimentation. At the time of the invention, it would have been obvious to one of ordinary skill in the art to vary the loading of the plasticizer to arrive at a suitable degree of plasticity in the final polymer.

15. Regarding claim 20:

16. Choi is silent with regard to the addition of the propylene carbonate after oligomerizing the polyamic acid.

17. An artisan of ordinary skill would recognize that the timing of the addition of the plasticizer would not be crucial to practicing Choi's invention, and therefore could be added at nearly any time. However, one of ordinary skill would also recognize the reactive carbonyl of propylene carbonate could interfere with the imidization process. Therefore at the time of the invention, it would have been obvious to one of ordinary skill in the art to add the propylene carbonate after partially imidizing, i.e. oligomerizing, the polyamic acid to ensure proper partial imidization.

18. Regarding claim 21:

19. Choi cures the precursor into a polyimide coating (col 6 ln 58-62).

20. Regarding claims 22-24:

21. The examiner takes the position that the polyimide of Choi in view of Peters and Hawley intrinsically has the transmittance, glass transition temperature, and water-absorption properties as presently claimed because it is the same polyimide as presently claimed.

22. Regarding claims 25-29:

23. Choi teaches the coating can be applied to silicon nitride (col 6 ln 58-62). Wafers, or films, of such materials are often used in the electronic industry. The examiner takes the position that a silicon nitride

film has the presently claimed conductive properties because it is the same as used in the present invention.

24. Claims 18-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choi et al. (US 5,554,684) in view of Peters et al. (US 4,965,337), and Fuijimoto et al. (JP 2000-305280).

25. Regarding claim 18:

26. Choi et al. (hereafter Choi) disclose a polyimide precursor composition (col 1 ln 33-62). Polar solvents are used, such as NMP (col 2 ln 4-20). Choi teaches a combination of aromatic dianhydrides can be used (col 2 ln 27-31), including BPDA (col 2 ln 47) and BPADA (col 2 ln 62). The diamine can be 4,4'-DDS (col 3 ln 29-30).

27. Choi is silent with regard to the molar ratio of the dianhydrides.

28. It has long been an axiom of United States patent law that it is not inventive to discover the optimum or workable ranges of result-effective variables by routine experimentation. *In re Peterson,* 315 F.3d 1325, 1330 (Fed. Cir. 2003) ("The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages."); *In re Boesch,* 617 F.2d 272, 276 (CCPA 1980) ("[D]iscovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art."); *In re Aller,* 220 F.2d 454, 456 (CCPA 1955) ("[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."). "Only if the 'results of optimizing a variable' are 'unexpectedly good' can a patent be obtained for the claimed critical range." *In re Geisler,* 116 F.3d 1465, 1470 (Fed. Cir. 1997) (quoting *In re Antonie,* 559 F.2d 618, 620 (CCPA 1977)).

29. See Peters et al. (hereafter Peters) which compares BPDA/SDAN and BPADA/SDAN polyimides. SDAN stands for 4,4'-sulfonyl dianiline, equivalent to 4,4'-DDS. Peters notes the two polymers have different glass transitions temperatures and solvent-resistance properties (col 13 ln 5-23). The examiner reasonably concludes, therefore, that an artisan of ordinary skill would recognize that using the dianhydrides as comonomers, as taught by Choi, would require optimization to achieve an acceptable balance between glass transition temperature, which affects *inter alia* processing properties, and solvent

resistance. At the time of the invention, it would have been obvious to one of ordinary skill in the art to vary the ratio of the dianhydrides, including over the broad range claimed by Applicant, to balance these properties.

30. Choi is silent with regard to the addition of a cyclic compound as claimed.

31. Fujimoto discloses a solvent system for polyimide precursors comprising 60-80% of a polar solvent, 10-30% of an ester, and 10-30% water to be used to prevent explosions (abstract). The polar solvent can be NMP, and the ester can be ethylene carbonate or propylene carbonate [0006-0007]. The examiner takes the position this amount of ethylene carbonate or propylene carbonate would intrinsically prevent discoloration of the polyimide.

32. At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the solvent system disclosed by Fujimoto in conjunction with the polyimide precursor disclosed by Choi to prevent explosions during use.

33. Regarding claim 19:

34. The precursor solution contains 5-20% by weight of solids (col 5 ln 2-4). Changing these values to 100 mass parts, results in the solvent being in the range of 400-1900 mass parts.

35. Regarding claim 20:

36. The present claim is written in a product-by-process format. The examiner takes the position the polyimide precursor taught by Choi, Peters, and Fujimoto would be indistinguishable from the presently claimed polyimide precursor.

37. Regarding claim 21:

38. Choi cures the precursor into a polyimide coating (col 6 ln 58-62).

39. Regarding claims 22-24:

40. The examiner takes the position that the polyimide of Choi in view of Peters and Fujimoto intrinsically has the transmittance, glass transition temperature, and water-absorption properties as presently claimed because it is the same polyimide as presently claimed.

41. Regarding claims 25-29:

42. Choi teaches the coating can be applied to silicon nitride (col 6 ln 58-62). Wafers, or films, of such materials are often used in the electronic industry. The examiner takes the position that a silicon nitride film has the presently claimed conductive properties because it is the same as used in the present invention.

Claim Rejections - 35 USC § 112

43. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

44. Claims 18-29 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

45. Claims 18 and 21 recite a cyclic compound "is present in an amount that prevents discoloration of a polyimide produced from the polyimide precursor." While the specification discloses the cyclic compounds prevent discoloration when firing at high temperatures (), and further discloses a broad range of amounts of cyclic compound (), there seems to be no support for the broad recitation of "an amount that prevent discoloration of a polyimide" as presently claimed. There is also no guidance as to whether the range disclosed in the specification prevents discoloration over the entire range.

46. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

47. Claims 18-29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

48. Claims 18 and 21 recite a cyclic compound "is present in an amount that prevents discoloration of a polyimide produced from the polyimide precursor." This phrase renders the claims indefinite. One of ordinary skill would not be apprised of the actual amounts of cyclic compound that would read on the present claims. Specific amounts appear to be particularly pertinent given the cyclic compounds were commonly used as solvents for polyimide precursors at the time of the invention.

49. Claim 20 recites the composition comprising "polymerized monomers of at least one…" It is not clear what monomers this refers to, or how this is different from the BPDA, BPADA, and diamine of claim 18 on which it depends. The examiner respectfully suggests the following language may appropriately satisfy Applicant's intentions and requirements under 35 USC 112:

> The polyimide precursor liquid composition according to claim 18, the polyimide precursor liquid composition comprising a polyamic acid of BPDA, BPADA, and the diamine of formula 3, and wherein the cyclic compound is added after the reaction of BPDA, BPADA, and the diamine of formula 3.

Response to Arguments

50. Applicant's arguments filed 27 April and 14 May 2009 have been fully considered but they are not persuasive.

51. Although Applicant notes an amendment to the Specification was filed on 23 June 2005, the amendment does not appear to address the objection raised by the examiner nor do any of the other amendments of record.

52. Applicant points to Tables 5 and 6 of the specification and submits the prior art does not recognize the presently claimed molar ratio of BPDA to BPADA provides "high transparency and toughness to the polyimide" (p7).

53. The examiner finds the data unpersuasive. Note all but one comparative example—which actually uses a ratio falling within the presently claimed range—passes Applicant's test of toughness. Therefore, it is not clear what effect the ratio has on the polyimide's toughness compared to those using ratios outside the presently claimed range. Regarding transparency, the data are inconclusive regarding the difference

of transparency between polymers made utilizing a ratio of monomers that falls within the presently claimed range and those made utilizing a ratio that falls outside of the range. Only four data points are not encompassed the presently disclosed range, two of which are “working examples” or examples according to the invention. These four examples use 100% BPDA only. Choi clearly teaches the use of more than one dianhydride. Therefore, these examples do not adequately reflect the teaching of the prior art. Regardless, note the examiner respectfully submits, it would have been obvious to one of ordinary skill in the art to vary the ratio of the dianhydrides, *including over the broad range claimed by Applicant*, to balance properties such as glass transition temperature and solvent resistance. Therefore, examiner maintains the rejection.

54. Applicant submits Hawley’s Condensed Chemical Dictionary “would not suggest using the cyclic compounds in the amounts required” by the claims (p8).

55. While the examiner agrees the Hawley’s Dictionary is silent with regard to preventing discoloration, the fact Applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). The examiner submits it would have been obvious to one of ordinary skill in the art to add propylene carbonate as a plasticizer to the polyimide precursor, including amounts that would intrinsically prevent discoloration, to create a polymer that has better flexibility, and also prolong the time before said polymer becomes brittle. There is no indication the amount of propylene carbonate used for plasticizer would not fall under the indefinite range disclosed by Applicant in the present claims.

56. Applicant’s amendment to claim 20 overcomes the previous rejection under 35 USC 112.

Conclusion

57. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Freeman whose telephone number is (571)270-3469. The examiner can normally be reached on Monday-Friday 7:30-5:00PM EST (First Friday off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Callie Shosho can be reached on (571)272-1123. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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